

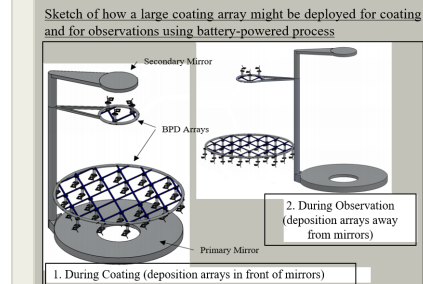
Battery-Powered Process for Coating Telescope Mirrors in Space, Phase I

Completed Technology Project (2017 - 2017)



Project Introduction

ZeCoat Corporation will develop a battery-powered, aluminum deposition process for making broadband reflective coatings in space (wavelength range: 30-nm to 2500-nm). The process uses an array of evaporation filaments powered by batteries contained in pressurized vessels placed in the vacuum of space. The vacuum coating process is scalable for large mirrors several meters in diameter, but is applicable to any size mirror. By simultaneously discharging batteries through individual evaporation filaments, a tremendous amount of energy may be released rapidly. By placing iridium (or a multi-layer interference coating) on the mirror initially (coated on earth), followed by a fresh coat of aluminum in space, the broadband response of the telescope could be extended down to 30-nm. Current coating technologies limit the reflectance response to 90-nm because of the absorbing fluoride coating which protects the aluminum from oxidation on earth. The ability to coat optics in space offers a tremendous potential benefit to astronomy because the 30-nm to 90-nm region is rich in spectral lines. Since molten metals such as aluminum are held onto a hot tungsten filament by surface tension, the proposed evaporation process will work in zero-gravity. A high aluminum evaporation rate has been shown to produce the least scattering and most highly reflecting aluminum coatings, particularly in the vacuum UV spectral region. To achieve future wavefront requirements over a large primary mirror, it is likely that many evaporation sources will be required. By placing the power supply (the battery) very near each evaporation filament, electrical losses are minimized. In Phase I, we will demonstrate feasibility using prototype battery-powered deposition (BPD) units previously manufactured at ZeCoat Corporation. In Phase II, miniaturized battery-powered unit will be designed and manufactured, and the coating process will be developed and tested in a simulated space environment.



Battery-Powered Process for Coating Telescope Mirrors in Space, Phase I Briefing Chart Image

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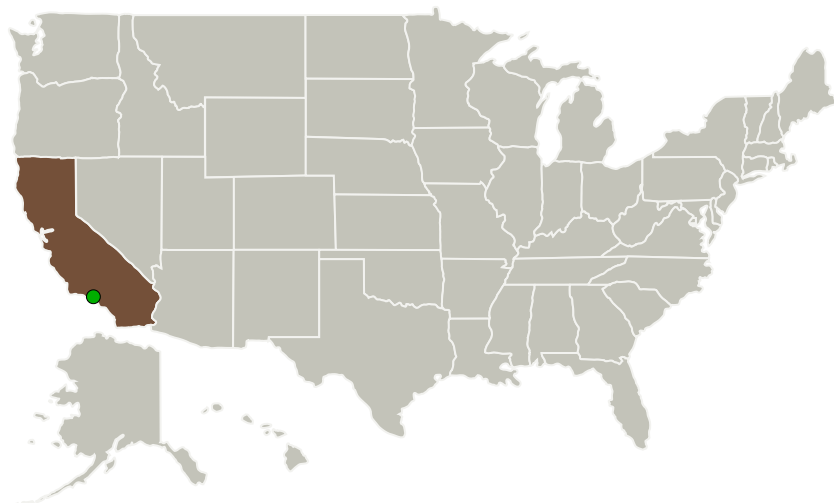
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
ZeCoat Corporation	Lead Organization	Industry	Torrance, California
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations

California

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

ZeCoat Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

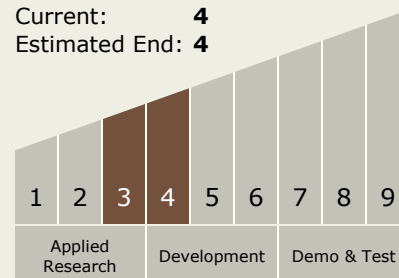
Carlos Torrez

Principal Investigator:

David Sheikh

Technology Maturity (TRL)

Start: 3
Current: 4
Estimated End: 4

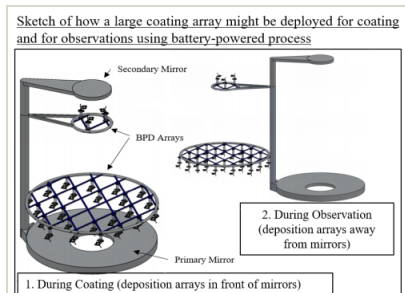


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Images



Briefing Chart Image

Battery-Powered Process for
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Phase I Briefing Chart Image
(<https://techport.nasa.gov/image/134015>)

Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.3 Optical Components

Target Destinations

The Sun, Earth, The Moon,
Mars, Others Inside the Solar
System, Outside the Solar
System